



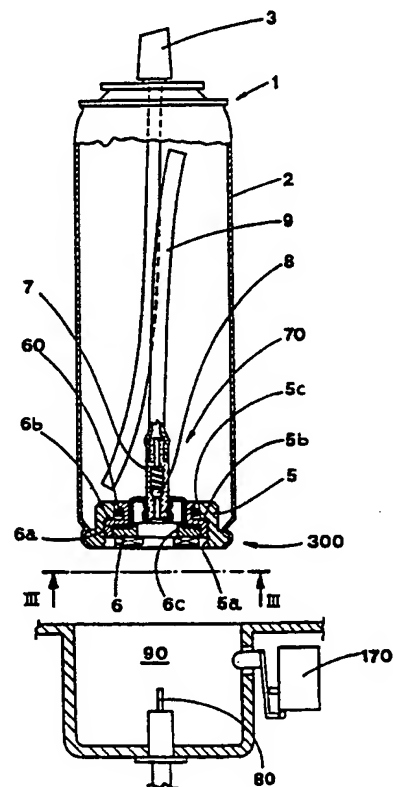
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> :  B65D 83/42, B65B 31/10	A1	(11) International Publication Number: WO 94/03380 (43) International Publication Date: 17 February 1994 (17.02.94)
<p>(21) International Application Number: PCT/IT93/00084</p> <p>(22) International Filing Date: 29 July 1993 (29.07.93)</p> <p>(30) Priority data: BO92A000299 31 July 1992 (31.07.92) IT BO92A000428 10 December 1992 (10.12.92) IT</p> <p>(71)(72) Applicant and Inventor: GRILLINI, Marco [IT/IT]; Via Murri, 62, I-40137 Bologna (IT).</p> <p>(74) Agent: DALL'OLIO, Giancarlo; Invention s.n.c., Via del Cestello, 13, I-40124 Bologna (IT).</p> <p>(81) Designated States: CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p>	<p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: REFILLABLE LIQUID MIXTURES AEROSOL DISPENSING CONTAINER

## (57) Abstract

The bottom (4) of the cylindrical body (2) of an aerosol can (1) comprises a ring (5), fastened to the body (2), and a plug (6) removably and sealingly fixed to the ring (5) after that a liquid mixture to be sprayed has been poured into the aerosol can (1). A member (70) allows the injection of cleaned compressed air into the aerosol can (1), the compressed air being the propellant means for spraying the liquid mixture outside. The spraying of the liquid mixture is carried out by means of an atomizer (3) associated to the aerosol can. The aerosol can (1) may be refilled with compressed air to spray all the liquid mixture, and may also be refilled with the same liquid mixture.



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# REFILLABLE LIQUID MIXTURES AEROSOL DISPENSING CONTAINER

## TECHNICAL FIELD

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The present invention relates to a refillable liquid mixture aerosol dispensing container, better known as aerosol can.

## BACKGROUND ART

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It is known that aerosol dispensing containers (commonly known as spray cans) are widely used throughout the world for spraying various kinds of liquid mixtures.

15 It is also known that a gas is used as propellant means for spraying the mixture contained in the can, in atomized form.

This gas (chloro-fluorocarbide) is mostly regarded as the cause of one of the most worrying events for the environmental balance on the earth, that is the thinning of the ozone layer in the atmosphere.

20 Another problem, also seen from the ecological point of view, is the disposal of millions of spray cans, many of which still contain some liquid because the propellant means has been exhausted earlier.

25 In order to limit the harm to the environment coming from the problem discussed above, various solutions have been applied.

30 These solutions provide for spray cans either equipped with a small pump that is operated by the user, or filled with propellant gas that is said to be innocuous.

None of the solutions described heretofore can be generally used for all kinds of liquid mixtures to be sprayed which are to satisfy different requirements.

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## DISCLOSURE OF THE INVENTION

The object of the present invention is to propose a spray can that can be widely used with all liquid mixtures to be sprayed, and that  
10 can be refilled both with the liquid mixture to be sprayed, and with the propellant gas.

Preferably the propellant gas is clean compressed air.

15 The refillable aerosol can is equipped at the top with an atomizer that can be actuated for spraying the mixture, and includes means allowing, when set in a first configuration, to inject a liquid mixture into the can body and being, when set in a second configuration, sealingly blocked to each other.

20

The aerosol can also includes a member designed to allow the injection, under the pressure, of the propellant means, into the same can, as well as to prevent the said mixture from coming out of the can.

25

The liquid regilling allowing means form the aerosol can bottom and include a ring, fastened to the aerosol can body, and a plug removingly and sealingly fixed to the ring, the member being fastened to the same plug.

30

## BRIEF DESCRIPTION OF DRAWINGS

The characteristic features of the subject invention, in accordance with the claims, are highlighted in the following, with particular reference to the accompanying drawings, in which:

- 5 - Fig. 1 shows a perspective view of the spray can and a device for refilling it with compressed air;
- Fig. 2 shows a side cross-section of a first embodiment of the spray can, and a cross-section of a portion of the refilling device of Fig. 1;
- 10 - Fig. 3 shows a bottom view of the spray can as seen from the plane III-III of Fig. 2;
- Fig. 4 shows a side cross-section of a second embodiment of the subject spray can;
- Fig. 5 shows a side cross-section of a third embodiment of the subject spray can;
- 15 - Fig. 6 shows a side cross-section of a fourth embodiment of the subject spray can;
- Fig. 7 shows a side cross-section of a fifth embodiment of the subject spray can;
- 20 - Fig. 8 shows a side cross-section of a sixth embodiment of the subject spray can;
- Fig. 9 shows a side cross-section of a seventh embodiment of the subject spray can;
- Fig. 10 shows a side cross-section of a eighth embodiment of the subject spray can.
- 25

#### BEST MODES FOR CARRYING OUT THE INVENTION

- Referring to the above-mentioned figures, reference numeral 1
- 30 indicates an aerosol can that is equipped at the top with an atomizer 3 of known type and manually operable. The aerosol can is also equipped with means 300 which allow to inject a prefixed

amount of liquid mixture to be sprayed into the can.

These means 300, which subsequently get closed sealingly, will be described in detail in the following.

5

The aerosol can has also a member 70 provided for the injection under pressure of a propellant means (e.g. clean compressed air) into the can. The member 70 is adapted to prevent the liquid mixture from coming out.

10

Referring to Figures 2 and 3, the aerosol can includes a cylindrical, hollow body 2 that is closed at the top.

15

The body 2 has also a bottom that is constituted by the liquid refilling allowing means 300, which in turn comprise a ring 5 and a plug 6. The ring 5 is fastened, in a known way, to the inner part of the body 2 and is so shaped that an inner threading 5a, an annular shoulder and a tapered or cylindrical hole 5c are defined in this order.

20

The plug 6 is removably, sealingly fixed to the ring 5 by means of an outer threading 6a that engages the corresponding threading 5a of the ring. The plug 6 has also a flange 6a, that goes in abutment on the shoulder 5b, and a seal 60 that is urged against the tapered, or cylindrical, hole 5c.

25

The member 70 is supported by the central portion of the plug 6, by suitable means provided for fixing it to the plug 6, and substantially includes a tube 7, inside which there is inserted a non return valve 8, and a flexible tube 9 that extends inside the body 2 and that is thrust onto the end of the tube 7. The plug 6 is also provided with driving teeth 10 that allow blocking and

30

unblocking of the same plug 6 to and from the ring 5.

In order to prepare the aerosol can 1, it is provided to remove the plug 6, to pour the liquid mixture to be sprayed into the body 2  
5 and subsequently to block the plug 6 to the ring 5.

The propellant means for spraying the above mentioned mixture is preferably constituted, as already said, by clean compressed air (i.e. without any traces of oil or other impurities), supplied from a  
10 dry compressor, suitably adapted to refill the aerosol cans 1. The dry compressor is set inside a case 100, illustrated as an example in the Fig. 1, provided with a seat for receiving the lower part of the aerosol can 1 to be filled: for this purpose in the seat there are provided a nozzle 80 and a microswitch 170 (Fig. 2).

15 The insertion of the aerosol can 1 in the seat 90 causes first the insertion of the nozzle 80 inside the tube 7 and the opening of the non return valve 8 provoked by the nozzle 80, and then the closing of the microswitch 170 contacts that operates the  
20 compressor engine, for the inlet of the clean compressed air into the can 1 according to a prefixed pressure value stabilized automatically.

At this moment the can 1 is ready to be used in the customary  
25 way, by operating the atomizer 3 and consequently ejecting the atomized mixture.

If the compressed air exhausts or its pressure drops, as a result the usage, before the liquid mixture is exhausted, it is sufficient to  
30 refill the can 1 in the already described way. If further liquid mixture is to be put into the can or if the possible traces of the mixture are to be removed therefrom, it is necessary to "vant"

previously the residual pressure by means of a second seat 91 of the case 100, in which the can 1 may be inserted: a pin, not illustrated, opens the non return valve 8 releasing the remaining air.

5

With reference to the Fig. 4, according to a second embodiment, the can 1 is still constituted by a cylindrical hollow body 2, closed at the top, while the bottom is defined by the means 300, constituted by a ring 5 and a plug 6.

10

The ring 5 is fastened, in a known way, to the inner part of the body 2 and is so shaped that an annular shoulder 51b and an internal threading 51a are defined in this order. The plug 6 is removably, sealingly fixed to the cited ring 5 by means of a flange 61b, with a seal 60a, which go in abutment on the annular shoulder 51b as a result of the plug threaded shank 61a being engaged with the above mentioned threading 51a.

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The member 70, made as already described, is supported by the central portion of the plug 6.

20

With reference to the Fig. 5, according to a third embodiment, the can 1 is still constituted by a cylindrical hollow body 2, closed at the top, while the bottom is defined by the means 300, constituted by a ring 5 and a plug 6. The ring 5 is fastened, in a known way, to the outer part of the body 2 and is so shaped that an annular shoulder 52b and an outer threading 52a are defined in this order.

25

The plug 6 is removably, sealingly fixed to the cited ring 5 by means of a flange 62b, with a seal 60a, which go in abutment on the cited annular shoulder 52b as a result of the plug threaded

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shank 62a being engaged with the above mentioned threading 52a. The member 70, made as already described, is supported by the central portion of the plug 6.

5 With reference to the Fig. 6, according to a fourth embodiment, the can 1 is still constituted by a cylindrical hollow body 2, closed at the top, while the bottom is defined by the cited means 300, constituted by a ring 5 and a plug 6. The ring 5 is made from the same body 2, and is so shaped that an internal threading 53a and  
10 an annular shoulder 53b are defined in this order.

The plug 6 is removably, sealingly fixed to the cited ring 5 by means of an outer threading 63a that engages the cited threading 53a and a flange 63b, with a seal 60c, which go in abutment on  
15 the above mentioned shoulder 53b. The member 70, made as already described, is supported by the central portion of the plug 6.

With reference to the Fig. 7, according to a fifth embodiment, the  
20 can 1 is still constituted by a cylindrical hollow body 2, closed at the top, while the bottom is defined by the cited means 300, constituted by a ring 5 and a plug 6. The ring 5 is made from the same body 2, and is so shaped that an annular shoulder 54b and an outer threading 54a are defined in this order.

25 The plug 6 is removably, sealingly fixed to the cited ring 5 by means of a flange 64b, with a joined seal 60d, going in abutment on the cited annular shoulder 54b as a result of the plug inner threading 64a being engaged with the above mentioned threading  
30 54a. The member 70, made as already described, is supported by the central portion of the plug 6.

With reference to the Fig. 8, according to a sixth embodiment, the can 1 is still constituted by a cylindrical hollow body 2, closed at the top, while the bottom is defined by the cited means 300, constituted by a ring 5 and a plug 6. The ring 5 is fastened, in a known way, to a semispheric (or frusto-conical) bottom, commonly used for closing conventional cans, a central part of which is removed.

The ring 5 is so constituted that a semispheric (or frusto-conical) seat 56, an annular shoulder 55b and an inner threading 55a are defined in this order. The plug 6 is removably, sealingly fixed to the cited ring 5 by means of a semispheric (or frustoconical) part 56 and a flange 65b with a related seal 60e, which go in abutment on the annular shoulder 55b as a result of the plug 6 threaded shank 65a being engaged with the above mentioned threading 55a. The member 70, made as already described, is supported by the central portion of the plug 6.

With reference to the Fig. 9, according to a seventh embodiment, the can 1 is still constituted by a cylindrical hollow body 2, closed by a cover 4a and a bottom 4b, while the cited means 300, constituted by a ring 50 and a plug 60, are fixed to the cover 4a.

The ring 50 is fastened, in a known way, to the cover 4a so that it is located inside the same body 2, and is so shaped that an inner threading 57a, an annular shoulder 57b and a tapered, or cylindrical hole 57c are defined in this order. The plug 60 is removably, sealingly fixed to the cited ring 50 by means of an outer threading 67a that engages with the cited threading 57a, a flange 67b going in abutment on the cited shoulder 57b and a seal 60f that is urged to adhere to the tapered or cylindrical hole 57c.

An atomizer 3, of known type, identical with the one mentioned in previous embodiments, is associated to the central portion of the plug 60. A member 70, made as already described, is fastened, in known way, to the above mentioned bottom 4b.

5

Fig. 9 shows the semispheric bottom, commonly used for closing conventional cans, a central part of which is removed.

With reference to the Fig. 10, the can 1, in an eighth embodiment, is constituted by a body 20, divided in two parts 21 and 22, upper and lower, respectively, while the means 300 are fastened to the parts 21, 22 and include an outer threading 20a made in the cited upper part 21.

15 The outer threading 20a engages with a correspondent inner threading 20b made in the lower part 22.

In order to prepare the can, it is necessary to unscrew the upper part 21 from the lower part 22 and then retighten them after having poured therein the mixture to be sprayed.

20

The atomizer 3 is associated to the upper part 21, while the member 70 is fastened to the bottom of the lower part 22, like in the embodiment of the Fig. 9. In the described embodiments the can is prepared in the same way as in the first embodiment.

25

Also the use of the compressor is the same, with some modifications made in order to suit different bottom shapes.

30 The dimensions of the can 1 may vary at will together with the suitable seats 90 and 91, which can be provided in larger number, made in the case 100. From what above the advantages of the

subject invention result evident.

#### INDUSTRIAL APPLICABILITY

5 The principal advantage derives surely from the usage of a propellant means, that is pure air, absolutely innocuous for the environment and suitable for all uses; the pure air, for example, is supplied by the dry compressor used for refilling. This type of compressor avoids oil particles in the compressed air.

10

Further advantages derive from the elimination of wastes of material necessary for disposable cans production as well as of liquid to be sprayed that with the subject invention aerosol can is used in full, or, if it is not fully used, will be recovered.

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Moreover, the compressor cost is easily redeemed, because the user can save a lot buying only the liquid, in economic containers.

20

The unscrewing of the plug is impossible when the can contains compressed air; in fact, the axial force acting on the plug due to air pressure inside the can, increases notably the force necessary to unscrew the plug from the ring.

25

It is understood that what above has been described only in the way of example, therefore possible constructive variants are within the same protective scope, as claimed in the following.

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## CLAIMS

1. Refillable aerosol can containing a liquid mixture to be sprayed and a propellant means, equipped at the top with an atomizer (3) that can be actuated for spraying the mixture, characterized in that it includes means (300) allowing, when set in a first configuration, to inject a liquid mixture into the same can and being, when set in a second configuration, sealingly blocked to each other, and a member (70), designed to allow the injection, under the pressure, of the said propellant means, into the same can, as well as to prevent the said mixture from coming out of the can.

2. Refillable aerosol can, according to claim 1, characterized in that said liquid regilling allowing means (300) form the aerosol can bottom and include a ring (5), fastened to the aerosol can body (2), and a plug (6), removingly, sealingly fixed to said ring (5), the said member (70) being fastened to the same plug.

3. Refillable aerosol can, according to claim 2, characterized in that said ring (5) is fastened to the body (2) and is so shaped that an inner threading (5a), an annular shoulder (5b) and a tapered or cylindrical hole (5c) are defined in this order, with a corresponding outer threading (6a), a corresponding flange (6b) and a seal (60) provided on the said plug (6) for allowing the fastening.

4. Refillable aerosol can according to claim 2, characterized in that the said plug (6) features driving teeth (10) designed to facilitate the engagement of the plug with the said threading made in the ring (5).

5. Refillable aerosol can according to claim 2, characterized in that

the said ring (5) is fastened to the body (2) and is so shaped that an annular shoulder (51b) and an inner threading (51a) are defined in this order, with a corresponding flange (61b), a seal 60a and a threaded shank (61a) being respectively provided on the said plug (6) for the said fastening.

6. Refillable aerosol can according to claim 2, characterized in that the said ring (5) is located outside the body (2) and is so shaped that an annular shoulder (52b) and an outer threading (52a) are defined in this order, with a corresponding flange (62b), a seal (60b) and an inner threading being respectively provided on said plug (6) for the said fastening.

7. Refillable aerosol can according to claim 2, characterized in that said ring (5) is made from the same body (2) and is so shaped that an inner threading (53a) and an annular shoulder (53b) are defined in this order, with a corresponding outer threading (63a) and a corresponding flange (63b) having a related seal (60c) provided on the said plug (6) for the said fastening.

8. Refillable aerosol can according to claim 2, characterized in that said ring (5) is made from the same body (2) and is so shaped that an annular shoulder (54b) and an outer threading (54a) are defined in this order, with a corresponding flange (64b) having a related seal (60d) and an inner threading (64a) provided on the said plug for the said fastening.

9. Refillable aerosol can according to claim 2, characterized in that the said ring (5) is located inside the body (2) and is so shaped that a semispheric or frustoconical seat (56), an annular shoulder (55b) and an inner threading (55a) are defined in this order, with corresponding semispheric or frustoconical part 66, flange (65b)

having a related seal (60e) and threaded shank (65a) being provided on the said plug (6) for the aforesaid fastening.

10. Refillable aerosol can according to claim 1, characterized in  
5 that said means (300) are fastened to a cover (4a) of the same aerosol can and include a ring (50), fixed to the said bottom (4a), and a plug (60) removably, sealingly fixed to said ring (50), with said atomizer (3) being joined to said plug, while the said member (70) is fastened to the bottom (4b) of the said aerosol can, joined  
10 to the said body (2).

11. Refillable aerosol can according to claim 10, characterized in  
that said ring (50) is located inside the body (2) and is so shaped that an inner threading (57a), an annular shoulder (57b) and a  
15 tapered or cylindrical hole (57c) are defined in this order, with a corresponding outer threading (67a), a corresponding flange (67b) and a seal (60f) are respectively provided on the said plug (60) for the said fastening.

20 12. Refillable aerosol can according to claim 1, characterized in that said aerosol can body (20) is made up of two parts (21,22), upper and lower parts respectively, while the said liquid filling allowing means (300) include a threading (20a), made in the said upper part (21) and a threading (20b), made in the said lower part  
25 (22), this latter threading being engaged with the former threading (20a), the said atomizer (3) being fastened to said upper part (21) while the said member (70) is fixed to said lower part (22).

13. Refillable aerosol can according to claim 1, characterized in  
30 that the said member (70) includes a tube (7), inside which there is inserted a non return valve (8), and a flexible pipe 9 that extends inside the same aerosol can, this flexible pipe being

thrusted onto to the end of the said tube (7), with the said non-return valve 8 designed to be opened, from outside, by the filling means (80), associated to a compressor, when they are inserted in the tube 7.

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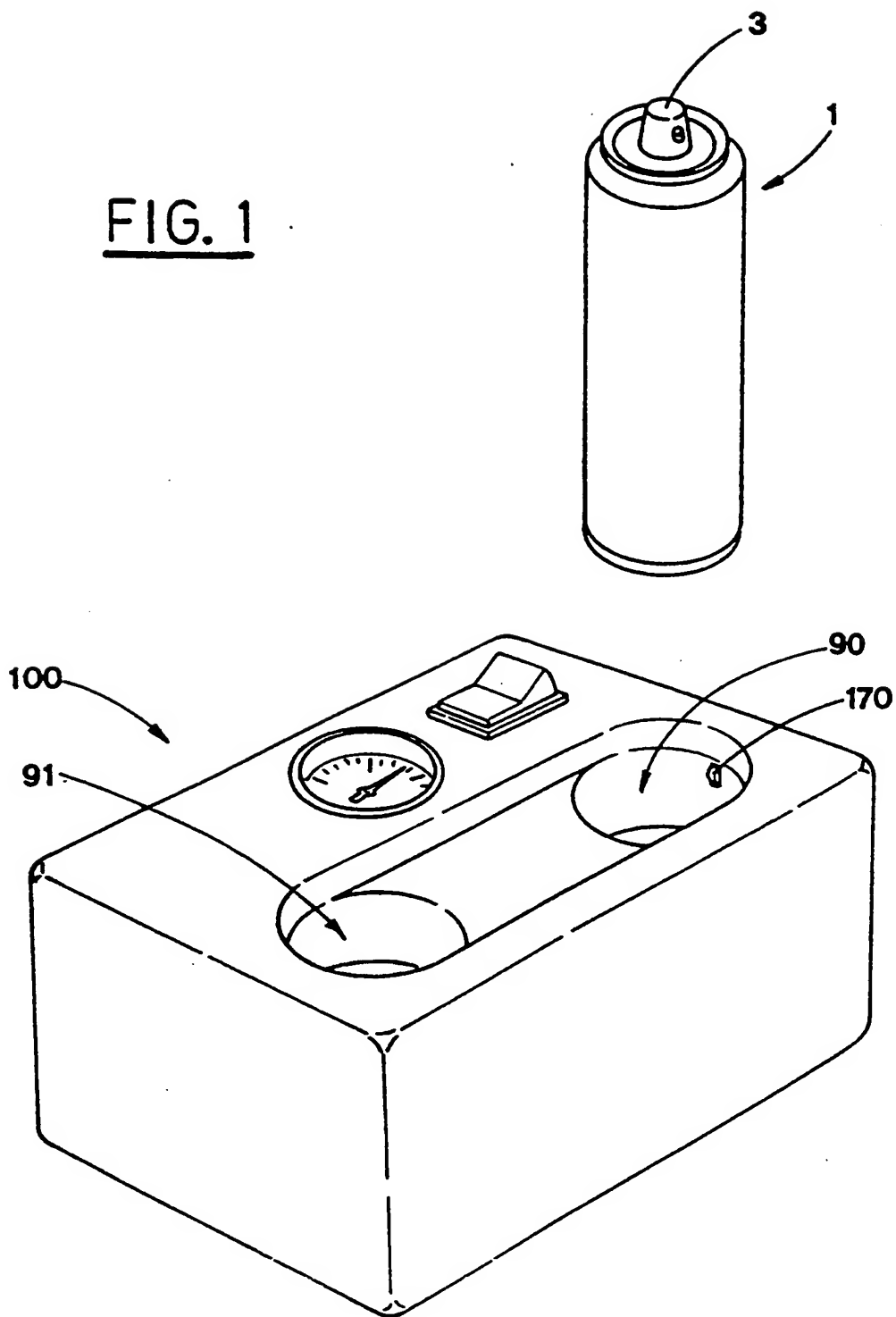
FIG. 1

FIG. 2

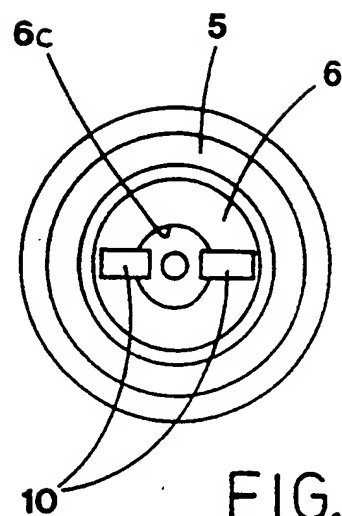
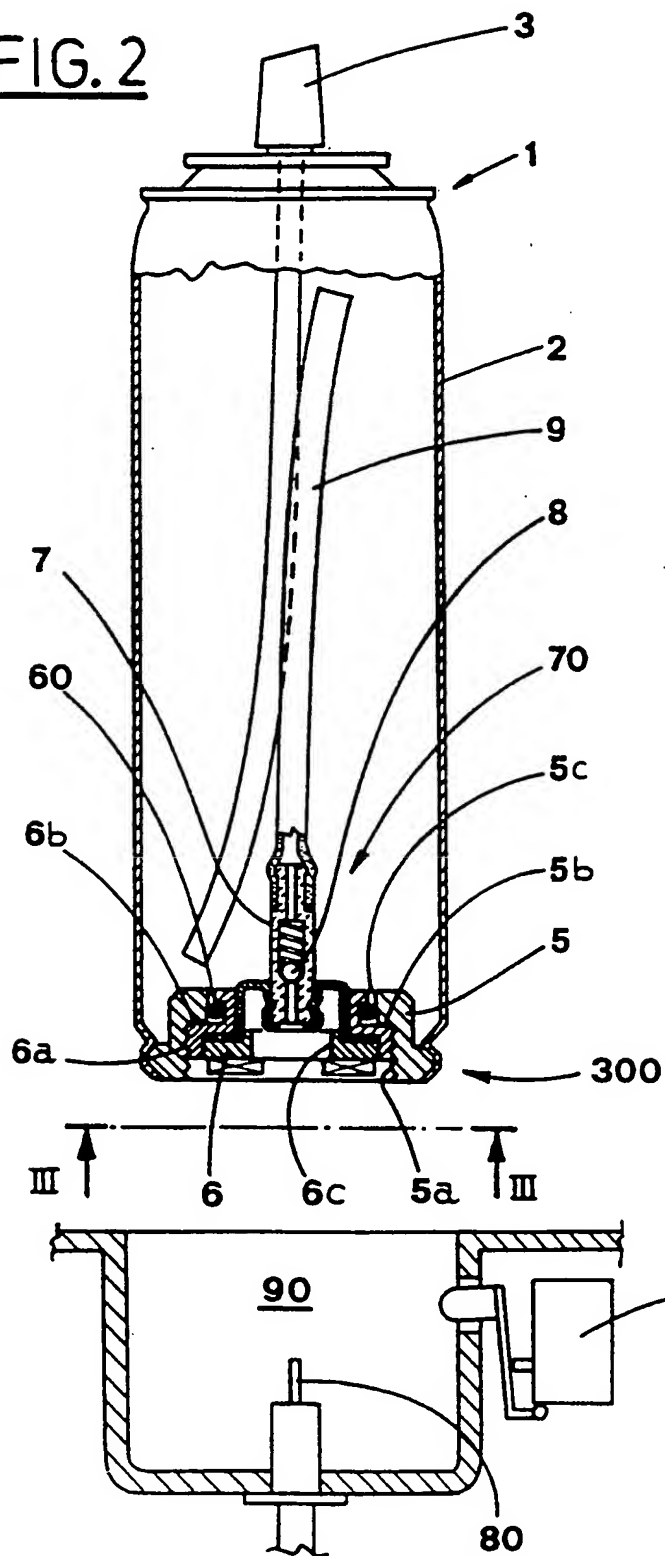


FIG. 3

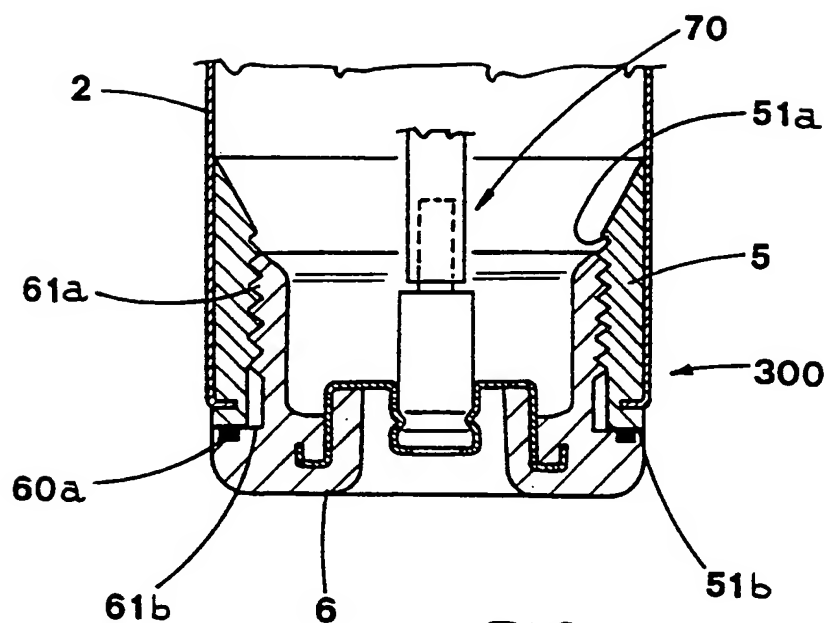


FIG. 4

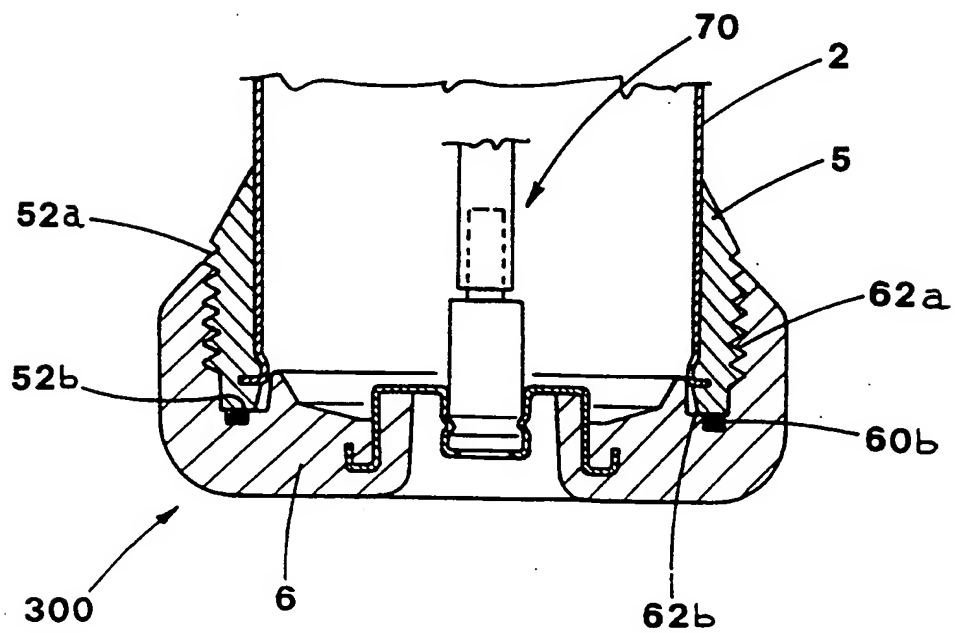


FIG. 5

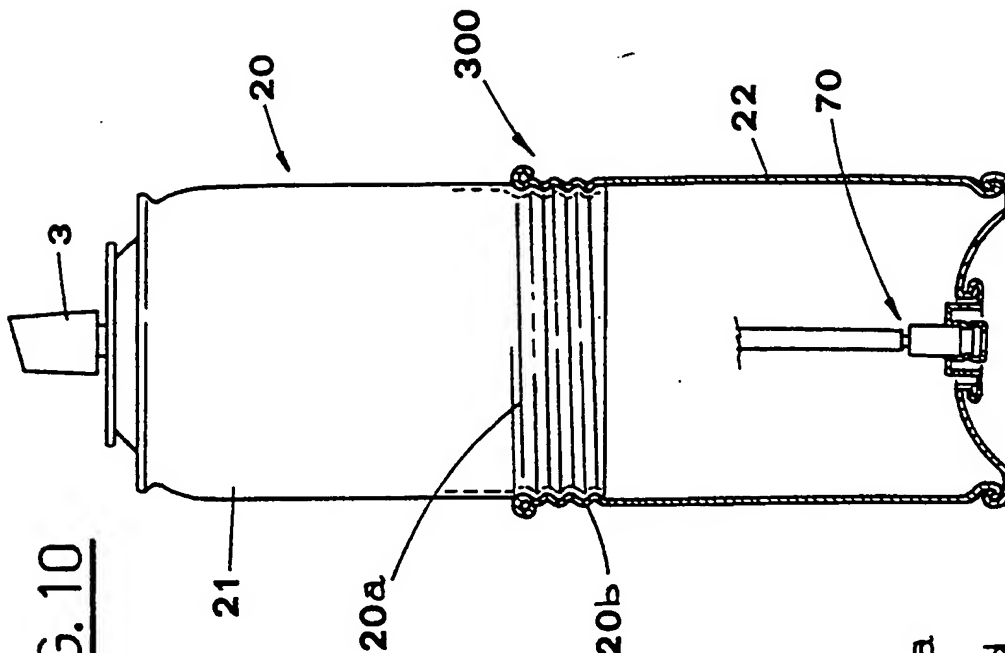


FIG. 10

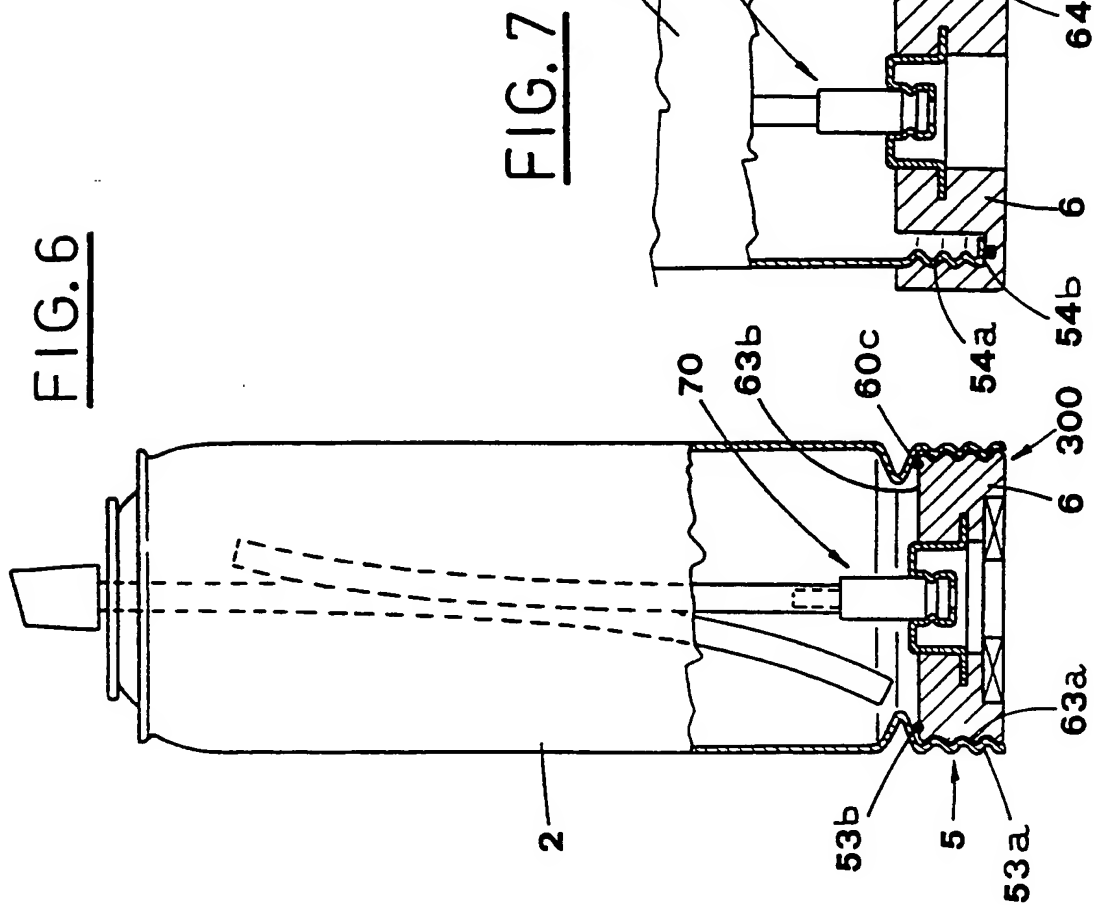


FIG. 7

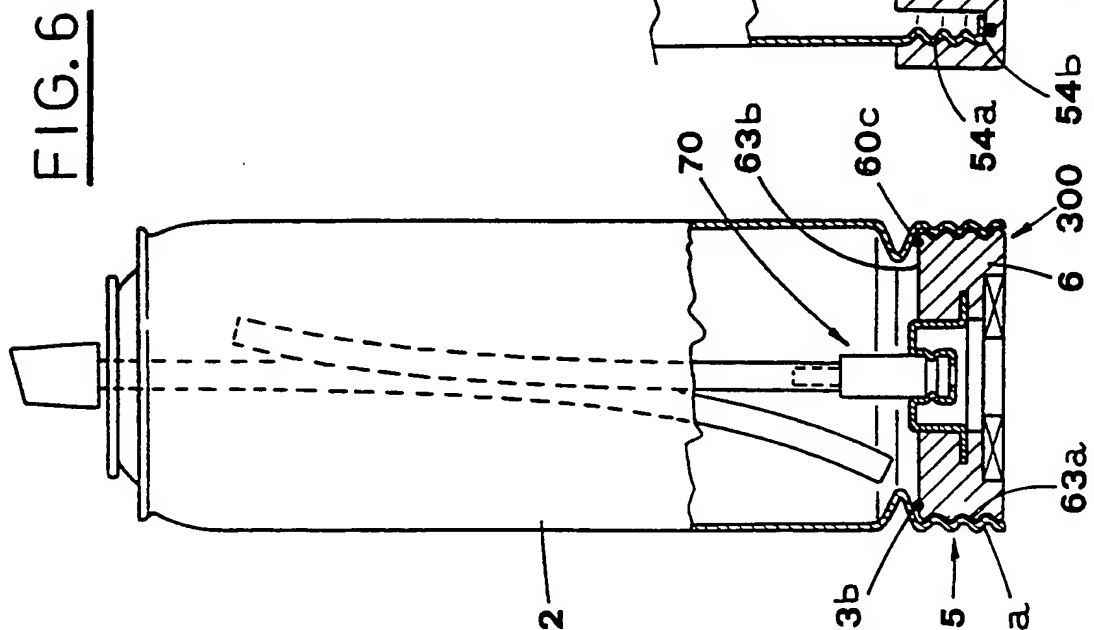


FIG. 6

FIG. 8

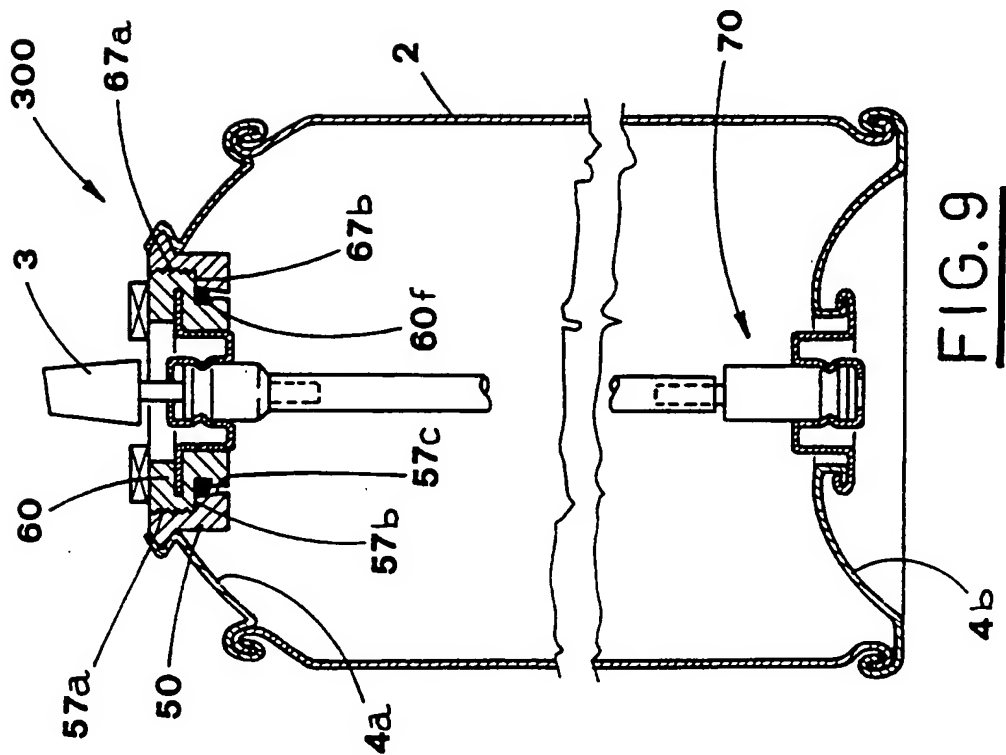
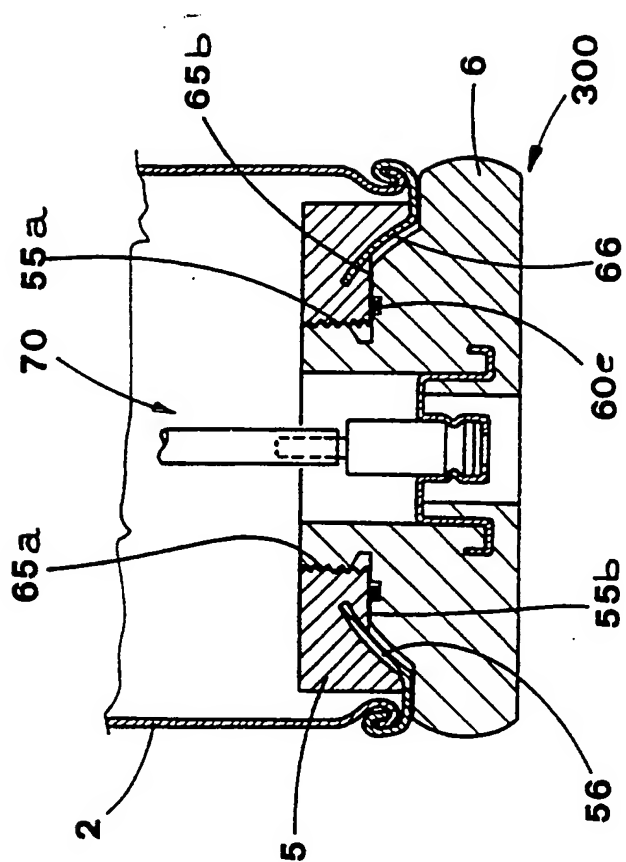


FIG. 9

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 93/00084

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC IPC <sup>5</sup> : B 65 D 83/42, B 65 B 31/10						
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Minimum Documentation Searched †</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%; border-bottom: 1px solid black;">Classification System ‡</th> <th style="width: 70%; border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="padding: 5px;">IPC<sup>5</sup></td> <td style="padding: 5px;">B 65 D 83/00, B 65 B 31/00</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ‡</div>			Classification System ‡	Classification Symbols	IPC <sup>5</sup>	B 65 D 83/00, B 65 B 31/00
Classification System ‡	Classification Symbols					
IPC <sup>5</sup>	B 65 D 83/00, B 65 B 31/00					
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT †</b>						
Category *	Citation of Document, †† with indication, where appropriate, of the relevant passages †‡	Relevant to Claim No. †‡				
X	US, A, 3 837 527 (KUTIK) 24 September 1974 (24.09.74), figs. 5-8; column 4, line 3 - column 5, line 28.	1				
A	--	2, 6, 10				
X	AT, B, 347 323 (ALGE) 27 December 1978 (27.12.78), figs. 1,2; page 3, lines 18- -32; claims.	1				
A	--	2, 3				
A	WO, A1, 91/01 257 (PLUM TECHNOLOGY PTY. LTD.) 07 February 1991 (07.02.91), figs. 2-4; page 9, line 9 - page 11, line 5.	1, 13				
A	US, A, 4 940 171 (GILROY) 10 July 1990	1, 10				
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: ††</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"Z" document member of the same patent family</p> </div> </div>						
<b>IV. CERTIFICATION</b>						
Date of the Actual Completion of the International Search <div style="text-align: center; font-size: 1.2em;">29 November 1993</div>		Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.2em;">4. 11. 93</div>				
International Searching Authority <div style="text-align: center; font-weight: bold;">EUROPEAN PATENT OFFICE</div>		Signature of Authorized Officer <div style="text-align: center; font-weight: bold;">BRÄUER e.h.</div>				

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, <sup>1)</sup> with indication, where appropriate, of the relevant passages	Relevant to Claim No.
	<p>(10.07.90), column 3, lines 10-18; claim 1.</p> <p>-----</p>	

## ANHANG

zum internationalen Recherchen-  
bericht über die internationale  
Patentanmeldung Nr.

## ANNEX

to the International Search  
Report to the International Patent  
Application No.

## ANNEXE

au rapport de recherche inter-  
national relatif à la demande de brevet  
international n°

PCT/IT 93/00084 SAE 78793

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